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(34) Title: **MOBILE TELEPHONE WITH IMPROVED MAN MACHINE INTERFACE**

(57) Abstract: The present invention envisages a GSM mobile telephone in which a line of icons is displayed on a display. As a user navigates through the displayed line of icons, the positions of the icons alter so that the selectable icon moves to the head of the line. This approach makes it very clear (i) which icon is selectable at any time and (ii) where that icon sits in relation to other icons at the same functional level (e.g. only first level icons will be present in one line). First level icons typically relate to the following functions: phonebook; messages; call register; counters; call diversion; telephone settings; network details; tools; voice mail and IrDA activation.

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Mobile Telephone with improved man machine interface

5 Field of the Invention

This invention relates to a mobile telephone and in particular to a mobile telephone with an improved man machine interface. The term 'mobile telephone' used in this patent specification should be expansively construed to cover any kind of mobile device with
10 communications capabilities and includes radio telephones, smart phones, communicators, and wireless information devices. It includes devices able to communicate using not only mobile radio such as GSM or UMTS, but also any other kind of wireless communications system, such as Bluetooth.

15

Description of the Prior Art

One of the problems facing the designers of mobile telephone user interfaces (often called 'man machine interfaces' or 'MMIs') is how to allow the user to comprehend the internal
20 status of the mobile telephone. For example, to select or initiate a function (e.g. to open an address book function, enter a PIN security number or to alter the ring melody) a user has to understand that the status of the telephone is such that the function can be selected or initiated. A closely related problem is how to enable a user to confidently alter the internal status of the phone. This process can be thought of as the problem of how to
25 enable a user to confidently navigate through the feature set of the telephone. Because many quite intricate operations have to be mastered early on for most mobile telephone users (setting security codes, altering ring melodies etc.), it is particularly important to facilitate the task of navigating to and activating features in the required way.

30 In addition, mobile telephones offer a very wide (and ever increasing) range of functions. The design of an effective MMI which can be (a) easily navigated by novices yet is (b) flexible enough to enable a large number of functions to be included, is a very

challenging task. In fact, it is widely acknowledged that few mobile telephone owners regularly use any but the most basic telephone features because current MMIs are difficult to fully understand. Hence, the technical problem of effectively enabling the user to understand the internal status of the mobile telephone has to date been inadequately
5 addressed.

One of the reasons why many conventional MMIs are inadequate is that mobile telephones are small handheld devices which generally include small display screens. The size of display screens, even for PDA type devices, is far too small to handle a rich
10 and effective MMI, such as the Apple Macintosh Operating System MMI. As a consequence, MMI designers have tended to use text based MMIs, even though the superiority of graphical user interfaces has long been accepted in the desktop computing environment.

Conventionally, the small display size has also meant that several hierarchies of functions have to be offered to a user: the interface can be thought of as having many layers, with the user having to first locate the correct top level function and then, within that function, progressively drill down (sometimes through 3 or more layers) to complete the required
15 task. Hence, for example, if a user wishes to enter a new telephone number into an address book stored on the mobile phone, he has to locate a top level function, typically
20 called 'Address Book'. He then selects that function and is presented with a list of second level functions relevant to the 'Address book' top level function. These second level functions typically include options for reading the contents of the Address Book, entering a new number and password protecting access to the address book. Say the user
25 selects the option for entering a new number; he then is presented with a third level screen display asking him to complete various fields with the contact information.

With pure text based, multi-level MMIs, it can be very difficult for users to build up an understanding of the structure of the MMI; without understanding, it is very difficult to
30 navigate extensively.

Very recently, some manufacturers have introduced GSM mobile telephones which are beginning to move away from the text only MMI. For example, the Philips Xenium telephone can display several icons on screen: Nokia and Mitsubishi have GSM telephones which can display one icon on a screen at a time. Reference may also be made to some PC operating systems and applications, in which a contextual help system is used: when the user places the mouse arrow over an icon, folder etc. for more than a couple of seconds, a help call-out or balloon appears with an explanation of the function of the icon, folder etc.

It is particularly important that the physical device(s) used to control navigation are not only easy to operate but also that the way in which they are controlled intuitively matches up with the navigation tasks to be accomplished. Conventionally, these navigation devices are 4 separate buttons (for example, for Up, Down, Accept and Reject). A user has to carefully select the correct button. That generally means that the user has to take his eyes off the screen. In some devices, a single rocker switch will overlie 4 separate buttons. But rocker switches can also require a user to take his eyes off the screen and instead concentrate on selecting and using the navigation button correctly. That in turn makes it far harder, especially for the inexperienced user, to follow and concentrate on the MMI. Where the MMI is difficult to follow anyway (as with text based, multi-level conventional GSM telephones, for example), navigation devices which require a user to take his eyes off the screen can be difficult to use.

Statement of the Invention

In accordance with a first aspect of the present invention, a mobile telephone comprises:

- (i) computing means for storing representations of one or more icons; and a

(ii) display operable to be controlled by the computing means to display one or more icons;

characterised in that the display is operable to show an array of several icons, the arrangement of the array altering as a user navigates through the array in a manner that visually indicates that the status of the computing means is such that the function associated with a single icon can be selected or initiated.

Typically, there will be an array which is a linear array of icons. A single icon is then distinguishable from the other icons by, for example, being at a prominent position within the array, such as at one end or the middle of the array. A circular array is also a possible option. The function associated with that single icon can be readily selected or initiated using a navigation tool such as a joystick. The icon itself can be thought of as being 'selectable'. The selectable icon may also have displayed in proximity to it a word or words describing the function of the icon to (i) give it even greater prominence and (ii) to make its function explicitly clear.

The icons in the array may be animated so that their positions on the display alter as a user navigates through them. For example, the icons in the linear array can be animated to appear to move forward along the line of the array as different icons become selectable, i.e. as the user navigates along the line.

Preferably, selecting an icon in an array causes some or all of the other icons in the array to alter in appearance and/or position. The alteration may be an animation in which the other icons appear to twist or revolve and turn into different icons. This may act as an indication that one is changing levels (e.g. from a top level function to a second level function) and aids understanding of the MMI.

The present invention envisages a GSM mobile telephone embodiment in which a line of icons is displayed on a display: one of the icons is clearly selectable by for example being at the head of the line and being the only icon with explanatory text associated with it,

typically in a balloon format. As a user navigates through the displayed line of icons, the identity of the selectable icon changes: this is reflected in the positions of the icons altering so that the selectable icon moves to the head of the line. This approach makes it very clear (i) which icon is selectable at any time and (ii) where that icon sits in relation to other icons at the same functional level (e.g. only first level icons will be present in one line). First level icons typically relate to the following functions: phonebook; messages; call register; counters; call diversion; telephone settings; network details; tools; voice mail and IrDA activation.

5 A zoom (i.e. magnification) function is preferably also provided by which a user can cause the size of the icon and/or the word or words explaining the function of that icon displayed on the display to be altered. The zoom function may be controlled by a volume up and a volume down button.

5 In one embodiment, the data representing an icon is stored in memory; the same data can be used to display the icon at normal size (typically 16x16 pixels) and also at one or more different sizes, such as an extended size (64x64). This scalability removes the need to store multiple representations in memory and therefore saves memory; instead a software algorithm alters the displayed size of the icon.

10

In another aspect, there is provided a mobile telephone comprising:

computing means for storing representations of one or more icons; and a

display operable to be controlled by the computing means to display one or more icons;

15

characterised in that the display is operable to show an array of several icons, the appearance and/or position of some or all of the icons in the array altering as a user selects an icon to visually indicate that the status of the computing means is changing.

The alteration may be an animation in which some or all of the icons appear to twist or revolve and turn into different icons.

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In a final aspect, there is provided a mobile telephone in which the idle screen alternates with an alert screen, each screen appearing for a pre-determined time. This leads to the layout of the idle screen not being cluttered with any kind of alert messages: conventionally, an alert message will be included together with the idle screen (e.g. '1 missed call'; 'You have a SMS'), but that clutters the screen and can obscure important branding information. In the present embodiment, the idle screen is shown for 5 seconds, and then an alert screen for 5 seconds if there are any alerts. The screens alternate until the user reads or reviews the alert screen in some way. Accessing the alert screen can take the user directly to the menu(s) which allow the user to respond to the alert. Hence, if the alert is that a SMS message has come in, once the user has seen that alert screen, is he offered a direct route into reading the message and/or responding to the message.

Brief Description of the Drawings

The invention will be further described with reference to the accompanying drawings in which:

Figure 1 is a plan view of a mobile telephone in accordance with the present invention;

Figure 2 is a side view of a mobile telephone in accordance with the present invention;

Figure 3 is a plan view of the possible movement which a joystick may make;

Figure 4 is a screen shot showing a top level screen;

Figure 5 is a screen shot showing the top level screen displayed when a user navigates down one step through the top level screen functions shown in figure 4;

Figure 6 is a screen shot showing the second level screen displayed when a user navigates one step deeper into the Phone Book function shown as selected in Figure 4;

5

Figure 7 is a screen shot showing the second level screen displayed when a user navigates down one step through the second level screen functions shown in Figure 6 (i.e. down through the Phone Book functions);

10

Figure 8 is a screen shot showing the second level screen displayed when a user navigates down one further step through the second level Phone Book functions shown in Figure 7;

15

Figure 9 is a screen shot showing the second level screen displayed when a user navigates up one step through the second level Phone Book functions shown in Figure 8.

Figure 10 is a schematic showing the effect of zooming on icon size;

20

Figure 11 is a schematic showing the effect of zooming on menu text size;

Figure 12 is a schematic showing the effect of zooming on message text size;

25

Figure 13 is a screen shot showing how the idle screen alternates with the alert screen.

Detailed Description

Referring now to Figure 1, a GSM mobile telephone is shown generally at 1. It includes the conventional features of a display 2, a start call button 4, an end call button 3 and

30

numeric keys indicated generally at 6. Start call button 4 is commonly labelled with a green telephone handset shown off-hook or marked with the word 'SEND'. End call button 3 is commonly labelled with a red telephone handset shown on-hook or marked with the word 'END'. In addition, it also includes a joystick 5, which can be more clearly seen in figure 2 as comprising a short cylindrical member up standing from the front face of the telephone 1. As shown in Figure 3, the joystick can be readily pushed by a user in one of 4 different directions. Joysticks of this kind are available from ITT Canon (ref. TPA 413G).

The MMI allows fast, intuitive navigation to take place. That is best appreciated from Figures 4 to 9. Figure 4 is a screen shot showing a top level screen; the Phone Book icon is readily understood by a user to have been reached since it is (a) at the top of its line, (b) is coupled with the cartoon style call out including the explanatory text 'Phone Book' and (c) no other icons include explanatory text. Hence the user is informed that the internal status of the telephone is such that Phone Book functions can be selected. (From a theoretical perspective, the mobile telephone can be thought of as a state machine; effectively representing the actual state to a user and enabling the user to alter the condition of the state machine is the task of the MMI).

In figure 4, the next icon down the line is a telephone with an arrow. This represents the 'Diversion' function. To reach the Diversion function, the user nudges the joystick down. Figure 5 shows the result: the Diversion function is shown at the top of the line, accompanied by a call out balloon stating 'Diversion'. Coupling the downwards nudge of the joystick with moving downwards through a line of icons makes navigation easily understood and readily achieved without any need for the user to take his eyes off the display.

Returning to Figure 1, the Phone Book function can be selected by simply nudging the joystick to the right; this takes the user to the Phone Book related features depicted in Figure 6 – a second level set of functions/features. The user is going deeper into the

levels now, so that a nudge to the right is a natural way of expressing this movement. Each of the four top level icons appear to twist around through 180 degrees when the joystick is nudged to the right. Four icons appear to continue twisting around, but these are now icons of the second level functions related to the Phone Book function. These 4
5 new icons appear to rotate through 180 degrees to yield the Figure 6 display.

Figure 6 shows that the 'Consult' feature has been reached since the associated icon plus call out is at the top of the line. The 'Consult' feature can be selected simply by nudging the joystick to the right again. A phone book would then be displayed. If a different
10 Phone Book feature is needed, then the user has to navigate down the list of second level Phone Book icons. One nudge down of the joystick takes the user to the display shown in figure 7: the feature 'Draft' has now moved to the top of the line and is accompanied by the call out 'Draft'. This icon, plus the other icons further down, appear to move up the line. The 'Draft' function can be readily selected with a nudge to the right. A further
15 nudge down however takes the user down the line of Phone Book features to yield the Figure 8 display, in which the 'Own number' feature has been reached. Moving up through the second level Phone book features is achieved through nudging the joystick up, as shown in Figure 9. Returning to the top level screen (i.e. as depicted in figure 4) is achieved through nudging the joystick to the left.

Appendix 1 shows a more comprehensive list of the icons and/or words displayed on the display 2 for different levels. It therefore lists the features and functions which can be navigated to and from using the joystick. As explained above, a nudge to the right takes one down into a deeper level of the system (e.g. across a row from top to second level).
25 The higher level icons twist around to reveal the icons of the lower level functions. Nudging left takes one up a level (e.g. across a row from third level to second level). The lower level icons twist around to reveal the icons of the higher level functions. Nudging down takes one down through the items at the same level (down a column) that are associated with the same immediately higher level function. The icons in the line appear
30 to move upwards. Nudging up takes one up through the items at the same level (up a

column) that are associated with the same immediately higher level function. The icons in the line appears to move downwards.

5 A zoom function is also provided by which a user can cause the size of the icon and/or the word or words explaining the function of that icon displayed on the display to be altered. The zoom function is controlled by a volume up (Figure 1, at 7) and a volume down button (Figure 1, at 8). The user can zoom in and out as shown in Figure 10; in addition the user can select that the word or words explaining the function of one or more icons is/are not displayed (Figure 10, bottom right). This gives an uncluttered look to the
10 display which can be more appealing to a more experienced user. Also, it liberates screen space for more icons, which again can be appealing to more experienced users. Another earlier use of the volume controls to control a zoom function may be useful even where icons are not associated with any kind of explanatory text at all and such an embodiment is within the scope of a further aspect of the invention.

15 Figure 10 also shows how icons can be made to overlap, thereby allowing more icons to fit onto a display without destroying legibility. This purely text based implementation is illustrated at Figure 11 for menu navigation. Zooming is also very useful when reading text, such as in a SMS message. This is shown in Figure 12.

20 Again, the use of the volume controls for zooming is intuitive, removes the need for additional zoom-specific keys and therefore saves cost and reduces the apparent complexity of the telephone. Arranging for the zoom In and zoom Out functions to be controlled by the volume keys is also attractive since it enables a user to perform a zoom
25 at any stage in the navigation process (except during a call or in idle, where speaker and ringer are respectively managed by these keys). This is particularly helpful in enabling an inexperienced user to experiment with and therefore learn the structure of the navigation system.

The zoom function may alter in dependence on the selected mode or function of the mobile telephone to give one or more zoom settings optimised for the selected mode or function. For example, when editing text, the zoom can magnify an amount that is most relevant to seeing text clearly (and multiple zoom settings can be provided and accessed through multiple nudges of the zoom button). A different zoom amount may be appropriate for zooming into the normal icon based menus, and another for zooming into text only menus. The zoom function works particularly well with the mobile telephone of the first aspect of the present invention.

The data representing an icon is stored in memory; the same data can be used to display the icon at normal size (typically 16x16 pixels) and also at one or more different sizes, such as an extended size (64x64) using a software algorithm. This scalability removes the need to store multiple representations in memory, which is a valuable resource.

Figure 13 shows the idle screen: the idle screen alternates with an alert screen, such as a Missed SMS screen, or a Voice Mail screen or a Missed Call Alert. This leads to the layout of the idle screen not being cluttered with any kind of alert messages: conventionally, an alert message will be included together with the idle screen (e.g. '1 missed call'; 'You have a SMS'), but that clutters the screen and can obscure important branding information. In the present embodiment, the idle screen is shown for 5 seconds, and then an alert screen for 5 seconds if there are any alerts, as illustrated in Figure 13. The screens alternate until the user reads or reviews the alert screen by pressing OK on the joystick. The phone will then display a static alert screen with one icon for every pending event (missed call, received SMS, ...). In Figure 13, the alert screen shows the Missed Call icon. This can be accompanied with the words "Missed Call".

Accessing the alert screen can take the user directly to the menu(s) which allow the user to respond to the alert. Hence, if the alert is that a SMS message has come in, once the user has seen that alert screen, is he offered a direct route into reading the message and/or responding to the message.

Appendix 1

Top level functions	Second level functions (all icons are task specific)	Third level functions (Words only, unless otherwise stated)	Fourth level functions (Words only, unless otherwise stated)
Phone Book Icon + words 'Phone book'	Icon + word 'Consult'	Open up address book	
	Icon + word 'Draft'	Enter Name	
	Icon + words 'Own Number'	Display Own number	
	Icon + word 'Capacity'	Displays storage info	
	Icon + word 'Restrict'	Enter restrictions PIN	
	Icon + word 'Business Card'	Enter your business card details	
Message Icon + word 'Messages'	Icon + words 'Write Message'	Create New	Write Message
		Use pre-defined	Select a pre-define message
	Icon + words 'In Box'	List in-coming messages	
	Icon + words 'Out-Box'	List outgoing messages	
	Icon + words	Displays storage info	

	'Capacity'		
	Icon + word 'Settings'	Service Center	Message Center Number
		Validity Period	Select validity period option
		Message type	Select message type (e.g. fax, e-mail, x400, standard text, telex
		Delivery Report	Select 'on' or 'off' options
		Reply via same	Select 'on' or 'off' options
		Melody	Select Melody option
	Icon + words 'Cell Broadcast'	Receive CB	Select cell broadcast 'on' or 'off'
Call Register Icon + words 'Call Register'	Icon + words 'Missed Calls'	Lists missed calls	
	Icon + words 'Received calls'	Lists received calls	
	Icon + words 'Dialled calls'	Lists dialled calls	Send message to; Call number; Forward calls to; Save number; Options to select; then takes you to appropriate screen
	Icon + words 'Delete'	Lists Missed calls, Received calls, Dialled Calls, All Calls	

Counters Icon + word 'Counters'	Icon + word 'Time'	Last call; all calls out; all calls in; Clear timers	Displays time count data
Divert Icon + word 'Divert'	Unconditional; all unanswered; if busy; if no reply; if not reachable	Activate; de-activate and status check	Voice, fax, data all options to select, then takes you to phone book to select number to receive diversions
Settings Icon + word 'Settings'	Icon + word 'Language'	List of various language options to select	
	Icon + words 'Alert tones'	Icon + words 'Melodies'	All cases; number stored; Number not stored; messages; Alarm to be selected; then gives list of melodies to select
		Icon + words 'Key Tones'	On, Off and DTMF tones to be selected
		Icon + words 'Deep Silent'	On or off to be selected
		Icon + words 'Ringer Volume'	3 ranges to be selected
	Icon + words 'Auto key lock'	On or off to be selected	
	Icon + word 'Security'	Change PIN and Disable PIN options	Enter PIN required
	Icon + word 'Time & Date'	Displays time and Date	Alter time and date
	Icon + word 'Auto-answer'	On or off to be selected	
	Icon + word 'Hot	Lists hot keys	

	keys'		
	Icon + word 'Contrast'	Select 1 - 3 contrast scale	
Network Icon + word 'Network'	Icon + word 'Services'	Barring	Select outgoing, incoming, barring password
		Call waiting	Activate, de-activate, status check
		Identification	See caller ID; call incognito; see connected ID; connect incognito; status check
	Auto-redial	On or off to be selected	
	Change network		
	Preferred networks	Lists preferred networks	
	Registration mode	Lists automatic, manual, force network	
Demonstration Icon + word 'Demonstration'	Give a demo of the phone		
Tools Icon + word 'Tools'	Calculator; calendar, games		
IrDA Icon + words 'IrDA Activation'	Activation option		

Claims

- 5 1. A mobile telephone comprising:
computing means for storing representations of one or more icons; and a
display operable to be controlled by the computing means to display one or more
icons;
characterised in that the display is operable to show an array of several icons, the
10 arrangement of the array altering as a user navigates through the array in a manner that
visually indicates that the status of the computing means is such that the function
associated with a single icon can be selected or initiated.
2. The mobile telephone of Claim 1 in which the array is a linear array of icons and a
15 selectable icon is at a prominent position within the array.
3. The mobile telephone of Claim 2 in which the selectable icon has displayed in
proximity to it a word or words describing the function of the icon.
- 20 4. The mobile telephone of Claim 1 in which the icons in the array are animated so
that their positions on the display alter as a user navigates through them.
5. The mobile telephone of Claim 2 in which the icons in the linear array are
animated to appear to move forward along the line of the array as different icons become
25 selectable.
6. The mobile telephone of Claim 1 in which selecting an icon in an array causes
some or all of the other icons to alter temporarily or permanently in appearance and/or
position.
30

7. The mobile telephone of Claim 6 in which the alteration is an animation in which the other icons appear to twist or revolve and turn into different icons.

8. The mobile telephone of Claim 1 in which several icons are displayed at the same time but only a single active icon has an accompanying word or words.

9. The mobile telephone of Claim 1 in which there is provided a zoom function by which a user can cause the size of the icon and/or the word or words explaining the function of that icon displayed on the display to be altered.

10. The mobile telephone of Claim 9 in which the zoom function is controlled by a volume up and a volume down button.

11. The mobile telephone of any preceding Claim in which the user can select that the word or words explaining the function of one or more icons is/are not displayed.

12. The mobile telephone of Claim 1 in which data representing an icon is stored in a memory and the same data can be used to display the icon at two or more different sizes.

13. A mobile telephone comprising:
computing means for storing representations of one or more icons; and a
display operable to be controlled by the computing means to display one or more
icons;

characterised in that the display is operable to show an array of several icons, the
appearance and/or position of some or all of the icons in the array altering as a user
selects an icon to visually indicate that the status of the computing means is changing.

14. The mobile telephone of Claim 13 in which the alteration is an animation in which some or all of the icons appear to twist or revolve and turn into different icons.

15 A mobile telephone in which the idle screen alternates with an alert screen, each screen appearing for a pre-determined time.

16. The mobile telephone of Claim 13 in which accessing the alert screen can take the user directly to the menu(s) which allow the user to respond to the alert.

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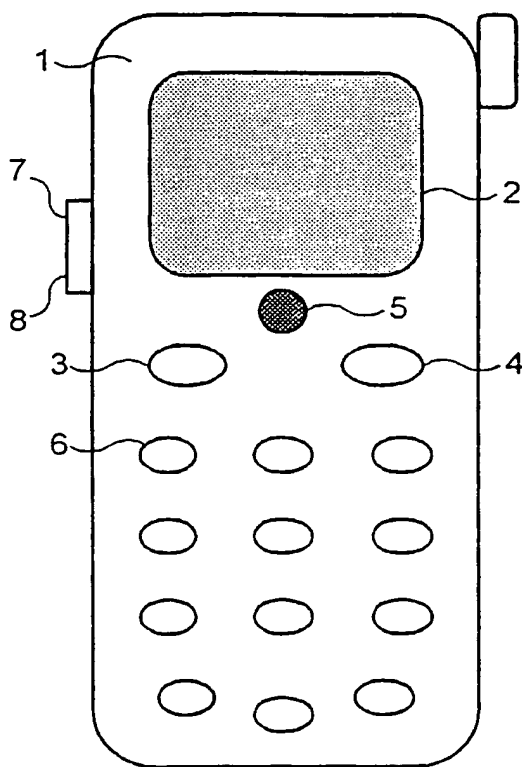


FIG. 1

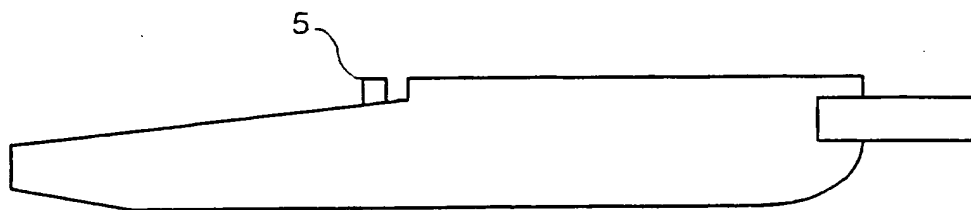


FIG. 2

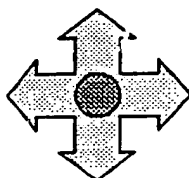
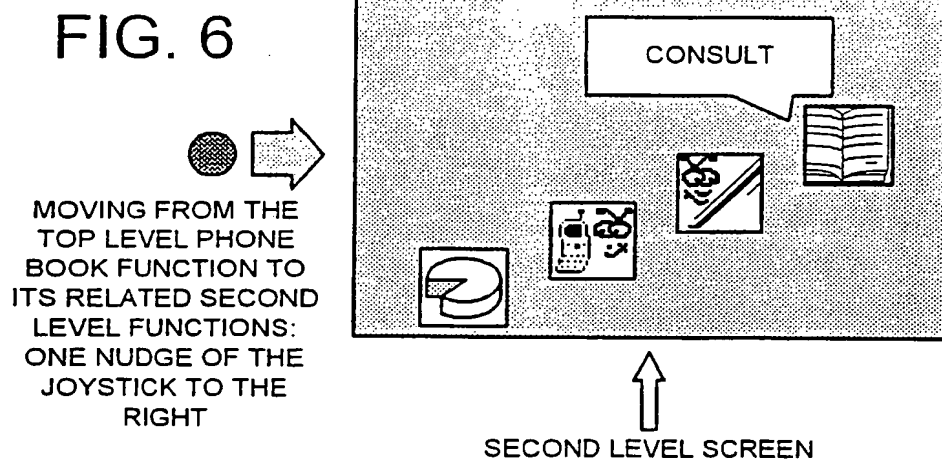
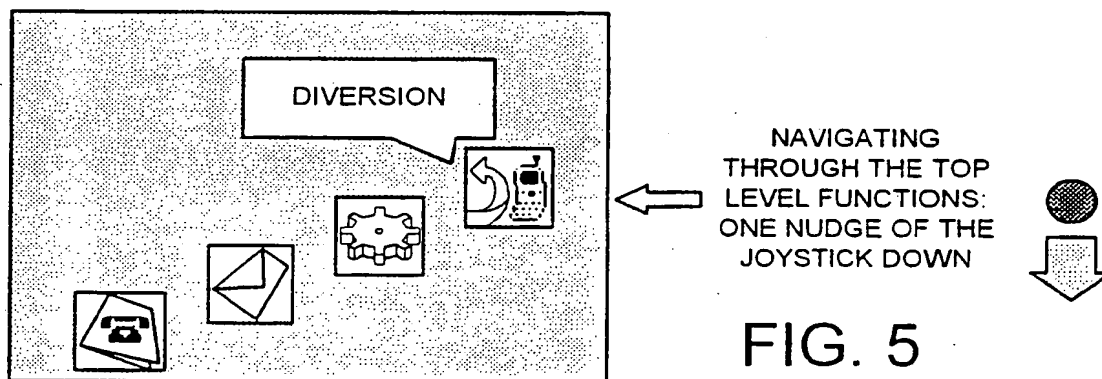
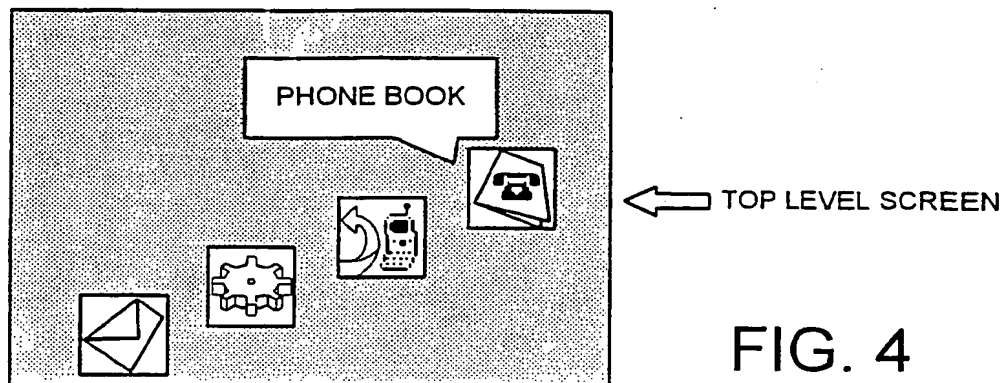


FIG. 3

2 / 5

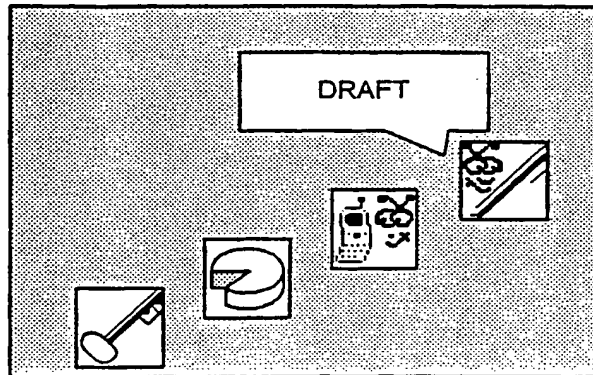


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NAVIGATING
THROUGH THE
SECOND LEVEL
SCREEN: ONE NUDGE
OF THE JOYSTICK
DOWN



FIG. 7



NAVIGATING FURTHER
THROUGH THE SECOND
LEVEL SCREEN: ONE
MORE NUDGE OF THE
JOYSTICK DOWN



FIG. 8

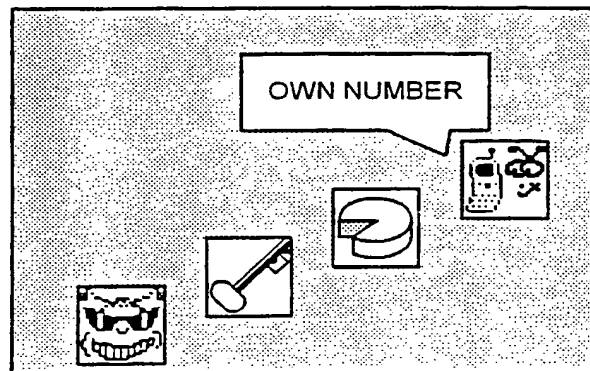
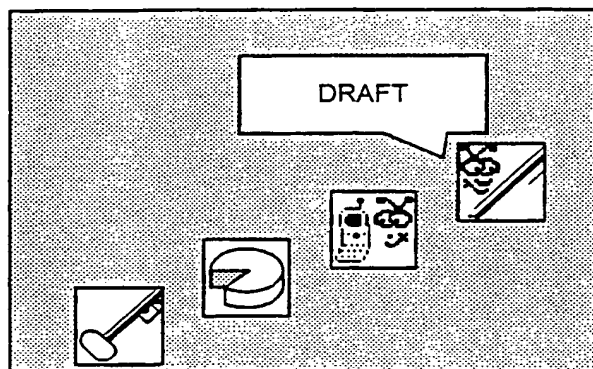


FIG. 9



NAVIGATING
THROUGH THE
SECOND LEVEL
SCREEN: ONE NUDGE
OF THE JOYSTICK
BACK UP AGAIN



4 / 5

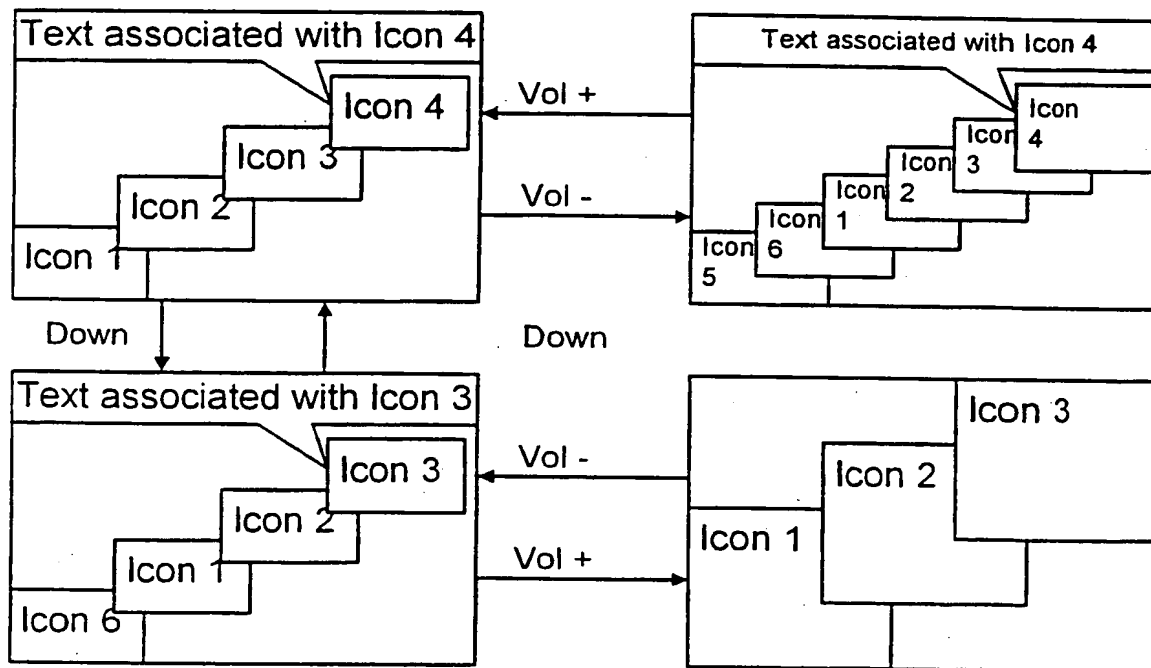


FIG. 10

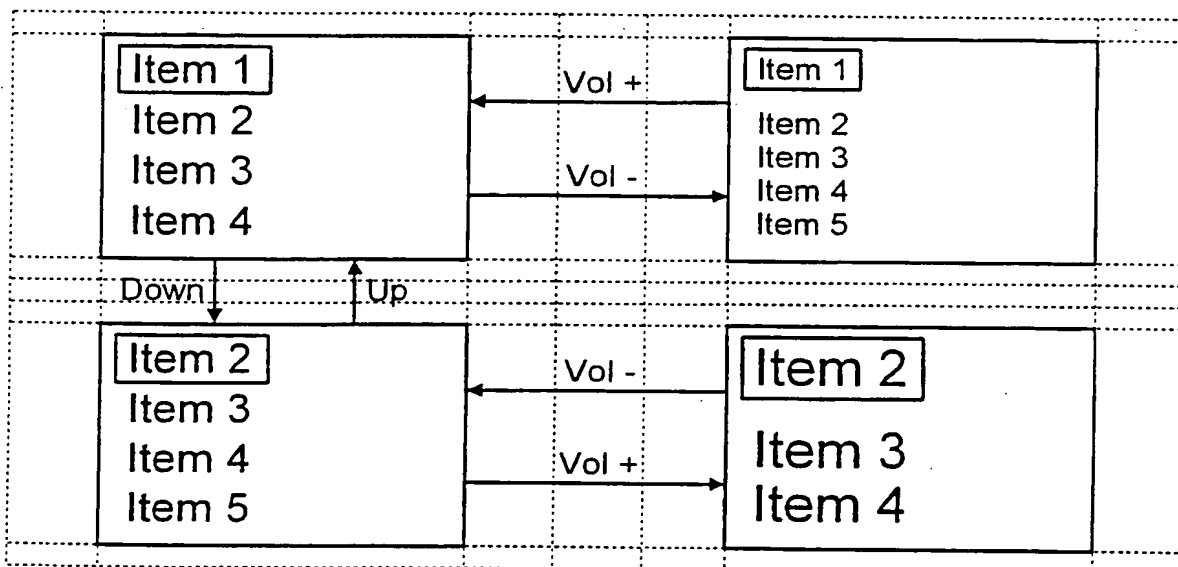


FIG. 11

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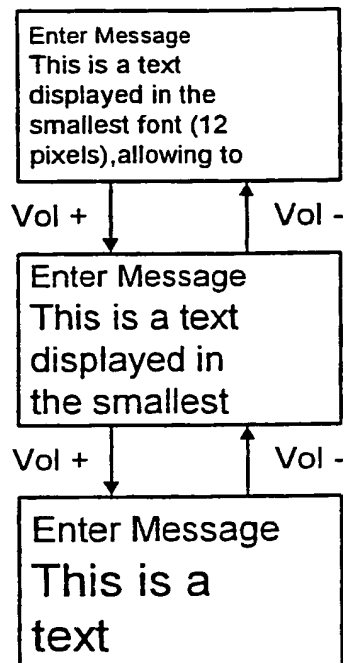


FIG. 12

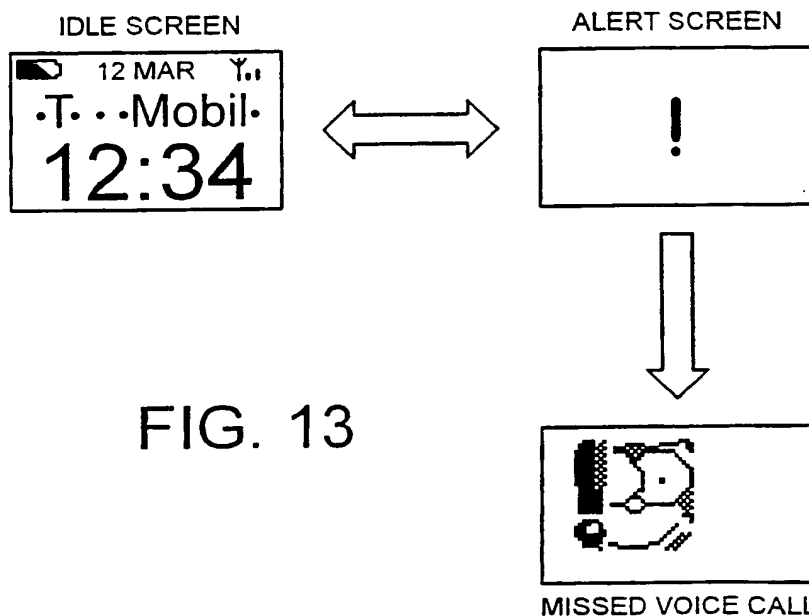


FIG. 13

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(72) Inventor; and

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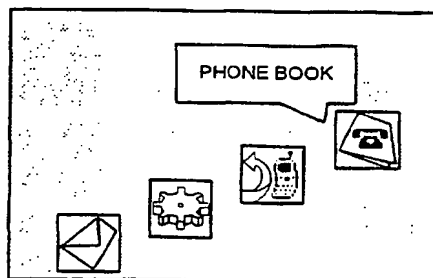
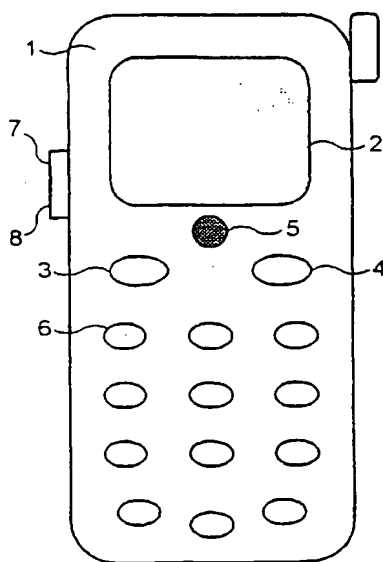
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(54) Title: **MOBILE TELEPHONE WITH IMPROVED MAN MACHINE INTERFACE**



(57) **Abstract:** The present invention envisages a GSM mobile telephone in which a line of icons is displayed on a display. As a user navigates through the displayed line of icons, the positions of the icons alter so that the selectable icon moves to the head of the line. This approach makes it very clear (i) which icon is selectable at any time and (ii) where that icon sits in relation to other icons at the same functional level (e.g. only first level icons will be present in one line). First level icons typically relate to the following functions: phonebook; messages; call register; counters; call diversion; telephone settings; network details; tools; voice mail and IrDA activation.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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International Application No.

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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